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The Role of Sequence Markers on Reading and Recall: A Comparison of Native and Nonnative English Speakers

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Abstract

Native and nonnative English speakers read informational passages containing four target points and later recalled the targeted information. The explicitness with which the target information was marked in the passage was varied. The targeted information was either explicitly signalled and enumerated (Full marking), explicitly signalled but not enumerated (Number marking), vaguely signalled (Vague marking), or neither signalled nor enumerated (No marking). A rating study (Experiment 1) established that the signalling manipulation produced the expected effects on rated ease of comprehending the logical development in the passage. In Experiments 2 and 4, native English speakers read and recalled the passages. In Experiment 3 students learning English as a second language (ESL) read and recalled the passages. In all three experiments, the more explicit the marking the better the recall of the target information. In Experiments 3 and 4, reading behavior was also measured. Processing time data indicated that reading time generally increased the more explicit the signalling. This trend was stronger in the native English than in the ESL speakers. In general there were only minor differences between native English and ESL speakers in the effects of sequence markers on reading and retention performance. Implications of these data for understanding the relation between signalling devices such as sequence markers and readers' strategies are discussed.

The Role of Sequence Markers on Reading and Recall: A Comparison of Native and Nonnative English speakers

The ability to read and learn from text material is a necessary skill if one is to succeed in formal educational settings. A number of previous studies indicate that texts differ in terms of the degree to which their organization is made obvious to the reader and that these differences influence how people read and later remember the presented information (e.g., Britton, Glynn, Meyer & Penland, 1982; Lorch & Chen, 1986; Lorch & Lorch, 1986; Mayer, Cook & Dyck, 1984; Meyer, & Rice, 1982). The organization of a text is often signalled by various rhetorical devices (Meyer, 1975). These rhetorical devices are of a number of types and are designed to signal to the reader the importance of some information relative to other information. One of the most important types of rhetorical devices signals the logical connections between pieces of information. Furthermore, within the general class of logical connectors several different relations are possible. For example, information may be sequentially related, as in a sequence of steps or facts all related to one particular theme or topic. Connectors that signal such relations are <u>next</u>, <u>first</u>, <u>finally</u>, etc. Also, information may be causally related and signalled by logical connectors such as <u>because.</u>

Empirical research on comprehension and recall of information from texts indicates that the explicit presence of such rhetorical devices affects the performance of adults (Meyer, 1975). Recently, Lorch and Lorch (1986) found that adults spent more time reading summarizing sentences if they were signalled as such than if they were not signalled. They also found that signalled information was better recalled than unsignalled. Number signals, a specific type of sequential marker, were examined by Lorch and Chen (1986). For passages that contained relatively long lists of facts, they observed longer reading times for information preceded by a number signal; as well, signalled information was recalled better than

unsignalled. From a theoretical perspective the occurrence of signals such as these may direct the reader's attention to the particular marked information and produce facilitative effects on retention, perhaps because more processing time is allocated to the marked information. However, for the markers to affect processing and memory for information, the reader has to first understand the significance of the particular rhetorical device, i.e., the functional value of any sucn marker terms. Given an understanding of the functional value, a second issue is whether there are empirical consequences for reading behavior and for retention. A straightforward expectation is that readers would spend more time reading marked information relative to unmarked, with increased processing leading to increased likelihood of retention.

Facilitative effects of signalling on retention can also occur in the absence of differentially greater processing of marked information. Signalling devices make explicit the relational information that can be inferred on the basis of the semantic content of the text. The inclusion in a text of markers is essentially a way to "insure" that all readers, regardless of their knowledge in the domain, extract the "correct" relation. For readers who can spontaneously generate appropriate semantic relations and overall text structure, the presence of markers would have little effect on the processing and retention of information. In fact, the presence of markers might actually make the reading process easier for such students because they do not have to provide the organization themselves. In this case, the signalling devices would be expected to enhance recall without necessarily affecting on-line processing. In fact, readers might actually spend less time reading texts containing signalling devices.

Signalling Devices and Students Acquiring English as a Second Language

Students acquiring English as a second language (ESL)need to acquire skills that enable them to recognize the functional value of explicit markers and to use these markers to guide their processing and information retention. The present research addresses the degree to which the reading and retention performance of ESL college students is affected by sequence markers. Of particular interest is whether the effects of such markers are similar for ESL

students and for native, monolingual English speakers. Although some investigators have found that reading behavior of ESL students is more reliant on graphic cues in text (as compared to semantic, contextual information) than is that of native English speakers (McLeod & McLaughlin, 1986), other evidence indicates that the comprehension strategies of ESL college students are similar to those of native English speakers (Block, 1986). Our own work dealing with the question answering strategies of a small number of ESL and monolingual English students indicated that ESL students tended to rely more heavily on the text than did monolingual English students (Goldman & Durán, 1988). However, the verbal protocols that we collected suggested that sequence markers were noticed by both types of students. Both native and nonnative English speaking students reading an oceanography text were observed to use a term like "Second,..." to ask themselves if they knew what was first (Goldman & Durán, 1988). However, in that study we were primarily interested in the strategies students used for answering questions and we did not systematically explore any one rhetorical device. Hence the data on sequence markers were largely anecdotal and we have no clear indication of the effects of signalling devices on memory for the information. Thus, the purpose of the present research was to examine whether there were differential effects of explicit sequential markers on reading behavior and on recall by ESL compared to monolingual, native English speaking students.

Specifically, relatively short passages (approximately 400 words in length) were selected from a variety of introductory level textbooks in the social and behavioral sciences. We selected passages in which a series of items were discussed. Passages were modified to include four target information items (sentences) per passage. Four versions of the passages manipulated the explicitness of the sequential markers. We predicted that target item recall would be best in the most explicit signalling condition and that subjects would spend more time reading specifically signalled information. Furthermore, we wished to describe the reading behavior of both ESL and monolingual English students on these texts.

Overview of the Experiments on Sequence Marker Effects on Reading and Recall of ESL and Native English Speaking Students

Three experiments examined the effects of sequence markers on the reading and retention performance of ESL and native English speaking college students. However, prior to conducting these studies, we thought it important to determine if the sequence marker manipulations did create passages that were differentially easy to understand. In Experiment 1, we had an independent group of native English speakers rate the passages for ease of understanding, ease of following the idea development and ease of understanding the vocabulary. Experiments 2, 3, and 4 pursued the reading and information retention issues. Experiment 2 examined recall of target information by monolingual, native English speaking students. Experiment 3 examined reading behavior and retention by ESL students and Experiment 4 looked at reading and retention by native English speaking students.

Materials

All four studies used the same 16 passages. Sixteen introductory texts containing instances of enumerated items were drawn from the following domains: cultural anthropology, geography, sociology, economics, psychology, oceanography, political science, biology, physical geography, and film studies. The texts were then modified to reflect four conditions that varied in their use of signalling devices. After modification, all passages were between 350 - 450 words in length, contained 19 or 20 sentences, and ranged in difficulty level from grade 10 thru 12, with two at the grade 8 level, according to the Flesch Reading Ease Grade equivalent index.

There were four signalling conditions for each passage. All four versions had the same title, began with the same three introductory sentences, and concluded with the same

three sentences. A sample text is shown in Table 1. The fou. signalling conditions were as follows.

Insert Table 1 about here

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1. Full signalling (Full): The topic sentence in the passage explicitly cued the number of target points to be discussed. Then the first target point was given and was explicitly marked by the word *First.* This sentence was followed by two sentences that elaborated it. The next target point followed and was explicitly marked by the number word *Second.* It, too, was elaborated with two sentences. Similarly for target points three and four.

2. Topic sentence enumeration cue (Number): The topic sentence explicitly cued the number of target points to be discussed. However, within the body of the text, the individual points were not explicitly marked, i.e., the words *first, second, third* and *fourth* did not occur in the text. Otherwise the text in this condition was identical to the Full version.

3. Vague enumeration cue (Vague): This condition was identical to condition 2 except that in the topic sentence a vague quantity term was used instead of the specific number, e.g., <u>several</u> appeared in place of the word <u>four</u> in the topic sentence.

4. No signalling (None): In the fourth condition, the topic sentence contained no reference to the number of points to be discussed. The body of the text was identical to that appearing in the Number and Vague conditions.

Experiment 1: Effects of signalling on comprehensibility, idea development and vocabulary

The purpose of Experiment 1 was the collection of normative, rating data on the set of passages that were used in the three subsequent experiments. We wished to examine the effects of the four signalling conditions on three types of ratings - general comprehensibility, specific idea development and vocabulary. Subjects used a 5-point Likert scale ranging from 1

(very easy) to 5 (very hard) to rate the following: ease of understanding the text; ease of following the idea development, and ease of the vocabulary in each passage. It was expected that the signalling manipulation would affect the first two rating scales but not the third.

Method

Subjects

Each of 96 introductory Psychology students volunteered to participate as part of a course requirement. All were native speakers of English.

Design and Procedure

Each subject rated each of the 16 passages on the three scales. Passages were presented in booklet form. There were four different booklets, representing a Latin Square counterbalancing design that insured that each passage appeared in each condition an equal number of times and that each subject received four passages in each condition. Subjects were run in small groups (4 to 8 students) during sessions lasting approximately 30 minutes.

Results and Discussion

Analyses of variance (ANOVAs) were conducted in two forms. The first form was a one-way ANOVA in which subjects were treated as a random factor and mean ratings were computed for each of the four within-subject conditions by collapsing across passages. The second form was a two-way ANOVA in which passages were treated as a random factor and mean ratings for each condition were computed by collapsing across subjects. In addition, a between-subjects factor, Set, was a blocking variable, necessitated by pragmatic constraints on Experiments 2, 3 and 4. In those studies, students read only half of the 16 passages, either Set A or B into which the passages had been divided. The Set factor included in the rating scale ANOVAs examined whether the two sets differed on the three scales. However, set was not a significant factor nor did it interact with signalling condition in any of the analyses. For those ANOVAs in which signalling condition was a significant factor, orthogonal contrasts on the means were computed.

Effects of signalling on rated ease of understanding. There was a significant condition effect on this scale, F (3, 285) = 2.64, p = .05, Ms_{error} = .188. However, it was significant only in the analysis using subjects-as-random-factor: for Passages, F (3,42) = 1.44. The means are shown in Table 2. The Full signalling condition was rated easier than the other three, F (1, 285) = 6.27, p < .05, but there were no differences between Number and Vague, nor between None and these two conditions taken together, Fs < 1.5.

Thus, ratings on ease of understanding the text were affected by explicitness of signalling. This effect could be expected to generalize over additional samples of students but not over additional samples of passages. When the topic sentence stated the number of target points and these were explicitly marked in the text, students rated these passages easier to understand than when there were no specific enumerators in the text.

Effects of signalling on rated ease of following the idea development. There was a significant effect of condition on this scale, F (3, 285) = 9.833, p < .001, Ms_{error} = .264, for subjects as random factor. This effect was also significant when passages were treated as random factor, F (3,285) = 7.165, p < .001, Ms_{error}= .06. Means for these conditions are shown in Table 2. Idea development was rated easier to follow in the Full signalling condition as compared to the other three, F (1, 285) = 27.58, p < .001. and F (1,42) = 9.95, p < .01. The other two contrasts (Number and Vague versus None; Number versus Vague) were nonsignificant. As predicted, idea development was rated easiest to follow in the Full signalling condition. The difference between number and vague topic sentence were in the expected direction but were nonsignificant. As with ease of understanding, an absence of specific numbering of the points in the text was associated with greater rated difficulty.

Effects of signalling on ease of vocabulary. As predicted, there were no effects of condition on this rating scale. The average vocabulary rating was 1.67, as shown in Table 2.

In summary, the rating study indicated that our signalling manipulations produced the predicted differences in the versions of the passages. Idea development was the easiest to follow

in the Full signalling versions of the passages. For this sample of passages, these were also rated as easiest to understand. Ratings of vocabulary difficulty were unaffected by the signalling manipulation. Given these results, the passages were used in the retention and reading behavior experiments.

Experiment 2: Effects of signalling on recall by monolingual native English speaking students.

The purpose of Experiment 2 was to examine the effects of signalling on information retention. Retention was measured by recall of the target points in the passages in response to a probe-sentence cue. It was expected that recall of target information would be greatest for texts presented in the Full signalling condition; that the Number topic sentence condition would be superior to the Vague; and, that each of these would be better than None, in which there was no signalling of the target points.

Method

Subjects

Thirty-two introductory Psychology students participated in the experiment as part of the course requirement. All were native English speakers.

Materials, Design, and Procedure

The 16 passages used in Experiment 1 were divided into two sets using a matched pairs procedure. Passages were matched on the basis of their mean ratings on the idea development and understanding scales obtained in Experiment 1 and on the basis of their Flesch Readability scores. We also adjusted the sets so that each set contained a relatively equivalent sampling of the social science areas from which the passages were drawn. Four versions of each passage were assigned to four different booklets using a Latin Square counterbalancing procedure to insure that each booklet contained two instances of each condition. Thus, across booklets and across subjects each passage occurred in all four conditions an equal number of times and each subject received two different passages in each condition. The eight passages in each booklet

were ordered so that the same condition did not succeed or follow itself. The design was a mixed design with Set the Between-subjects factor (2 levels) and signalling condition the within-subjects factor (4 levels).

In addition to the eight experimental passages, each booklet contained one practice passage that contained no signalling. Subjects were told to read the passages carefully because they would later be asked to recall the information. The task was illustrated with the practice passage. After four of the experimental passages subjects did a short set of multiplication problems to counteract effects of short term memory. Then subjects were asked to recall the target information in writing. The topic sentences from the None condition were used to cue recall of the target points, e.g., In the passage about the Ideal State, what were the basic issues that concerned Plato? The second set of four passages was then read and the recall completed. Subjects were run in small groups in sessions lasting 1.5 to 2 hours.

Scoring

The recall protocols were scored in two ways: target point and elaborated. In the target point scoring, credit was given for recall of each targeted point if that point or any of its subpoints were included in the protocol. There was thus a maximum score of 4 for each passage. In the elaborated scoring, target points and subpoints were scored separately and there was a maximum score of 12 for each passage. Credit was given if the gist of the information was recalled. Each recall was scored by two independent raters. Reliability in scoring was 94.6% and agreements were resolved in discussion. The dependent measure was the mean recall per condition (range 0 - 4 or 0 - 12).

Results and Discussion

ANOVAs were computed on the target point and on the elaborated scoring (1) treating subjects as a random factor and analyzing mean recall in each condition, collapsing across passages, and (2) treating passages as a random factor and collapsing across subjects.

Treatment condition was the within-subjects (or within-passages) variable and passage set was the between-subjects (or passages) variable.

For target point recall, there was a main effect of signalling condition. $\underline{F}$ (3, 90) = 10.47, $\underline{p} < .001$, $Ms_{error} = .567$, for subjects and $\underline{F}$ (3, 42) = 9.74, $\underline{p} < .01$, $Ms_{error} = .306$, for passages. The set effect and the interaction of set and condition were nonsignificant. The means for the signalling condition effect are shown in Table 3. Orthogonal contrasts on the signalling effect indicated that target point recall was significantly better in the Full signalling condition (2.5 out of 4) than in the other three (Mean = 1.65), $\underline{F}$ (1, 90) = 30.5, $\underline{p} < .001$. The other two orthogonal contrasts were nonsignificant. An additional contrast between the Full and the Number condition indicated that recall in the Full condition was greater than in the Number (1.73) condition, $\underline{F}$ (1, 90) = 8.36, $\underline{p} < .01$. The same pattern of results obtained in the elaborated point analysis. Full signalling produced more recall (3.00 out of 12) than the other three conditions (Mean = 2.00), $\underline{F}$ (1, 90) = 25, $\underline{p} < .001$, $Ms_{error} = .935$, for subjects and $\underline{F}$ (1, 42) = 15.74, $\underline{p} < .01$, $Ms_{error} = .77$ for passages. The other contrasts were nonsignificant.

Insert Table 3 about here

Despite the nonsignificant statistical contrasts, the data in Table 3 indicate that the means for the Number, Vague and None conditions were ordered in the predicted direction. That is, recall was somewhat higher in the Number condition than in the Vague and None conditions and the Vague condition was slightly better than the None condition.[1]

Thus, as predicted, target point retention was better if passages contained explicit enumeration of the target information than if these signalling devices were absent. The pattern of data across the other three signalling conditions indicated much weaker effects of a signalling

device that was present only in the topic sentence. Having demonstrated the basic effect of signalling on retention, we pursued effects of on reading behavior in Experiments 3 and 4.

Experiment 3: Effects of sequence markers on reading time and recall by ESL students.

The purpose of this study was to examine the effects of sequence markers on the recall and the reading behavior of ESL students. The experiment was identical in design to Experiment 2 except that students read the material one sentence at a time on a microcomputer screen. They were permitted to "flip" backwards and forwards through the text. We recorded this sequence of behaviors. Also, the time spent reading (viewing) each of the segments comprising the complete text was recorded.

Method

Subjects

Sixteen ESL students were paid $5 per hour to participate in the study. They were recruited from ESL courses at a university in Southern California. The courses from which the students were recruited are at the intermediate level of English language skills and students must take one additional course prior to satisfying the university's English language proficiency requirement. The majority of the students were second or third quarter freshmen and thus most of them had taken no more than one course in the various subject matter areas discussed in the passages used in the study.

Each student completed a background questionnaire prior to reading the texts. The ESL students reflected a range of language backgrounds, although the majority (9) spoke Chinese as their native language. An additional four were native speakers of Vietnamese; the remaining three students spoke German, Spanish, or Danish as their native languages. Only one of the ESL students had been born in the United States. Eleven students were in the age range 10 - 14

years when they were first exposed to English and five were in the age range 2 - 8 years. Students were asked to report their SAT verbal and TOEFL scores. The mean of the SAT scores was 363, range 200 - 530, with 13 students reporting. The mean score on the TOEFL was 543, range 507-587, with 6 students reporting.

Materials, Design, and Procedure

The passages were the same as those used in Experiment 2. They were again divided into two sets, each set containing 8 passages. Thus, there was one Between-subjects factor (passage set) and signalling condition (4 levels) was the Within-subjects factor.

Students viewed each of 8 passages, one sentence at a time, on a Macintosh Plus microcomputer screen. Specially developed software recorded the amount of time spent on each sentence and tracked the subjects forward and backward movement through the sentences in the text (Saul, Pohl, & Goldman, 1988). As in Experiment 2, recall followed four texts and was cued by the topic sentence from the None condition. Students were tested individually in sessions lasting approximately 2 hours.

Scoring

The recall protocols of these students were scored as described in Experiment 2. Two indices of reading behavior were calculated: reading rate and processing time. Each was calculated per word because the sentences had different numbers of words. As indicated above, students could go back to a sentence as many times as they wished. The rate measure was computed by dividing the total time spent on the passage by the number of words that each subject actually read per passage. The lower the value of the rate, the quicker the subject was reading. The rate measure does not, however, indicate how much processing time a subject spent per word. We estimated processing time per word by dividing the total time spent on the passage by the total number of words in the passage. [2]

Results and Discussion

Recall

ANOVA on the mean number of target points recalled (max = 4) indicated no effect of set nor interactions with the condition variable for either of the ANOVAs, i.e., subjects-as-random factor or passages-as-random factor. There was a significant effect of condition, F (3, 42) = 8.14, p < .001, Ms_{error} = .447 for subjects and F (3, 42) = 5.03, p < .01, Ms_{error} = 2.9 for passages. The means for the condition effect are shown in the middle panel of Table 3. Orthogonal contrasts indicated that Full signalling lead to greater recall than the other three conditions, F (1, 42) = 13.87, p < .01 (subjects) and F (1, 42) = 8.54, p < .01 for passages. Furthermore, Number lead to greater recall than Vague, F (1, 42) = 6.32, p < .05 (subjects) and F (1, 42) = 3.92, .1> p < .05 (passages). An additional contrast indicated that the Full and Number conditions did not differ (subjects and passages). The same pattern of significant effects was obtained when the elaborated scoring data were analyzed.

Reading time

ANOVA on the mean rate per word measure indicated that there were no significant differences in rate across the four conditions, F < 1, for subjects and for passages. Subjects read at a rate of approximately 600 milliseconds per word and all means were within 20 milliseconds of one another. The data are displayed in Figure 1. For the mean processing time measure, also shown in Figure 1, there was again no effect of condition, F (3, 45) = 1.24 for subjects and F < 1 for passages. Subjects spent an average of almost one second per word.[3] Despite the lack of statistically significant differences on the processing time measure, the magnitude of the means are in the predicted direction and are consistent with the pattern of recall effects: Students spent the longest on passages with Full signalling and spent the shortest amount of time on the passages with Vague or No signalling.

Insert Figure 1 about here

Thus, predictions regarding the effects of explicitness of marking on recall of the target points were confirmed for the ESL students. When the specific number of points was cued (Full and Number conditions) recall was better than when vague or no information was given regarding the number of points to be developed in the text. The presence of the explicit number cue in the topic sentence may be acting as an aid either during original encoding, during retrieval or both. The reading rate data indicated no differences among the four conditions. The processing time data suggested a tendency for students to reread the material more when there was more explicit signalling. [4]

Experiment 4: Effects of sequence markers on reading time and recall *by native English speaking students.*

This study was an exact replication of Experiment 3 except that monolingual, native English speaking students served as subjects.

Method

Subjects

Sixteen native English-speaking students enrolled in an introductory Psychology course participated in the study. Instead of monetary payment, these students received credit toward their course requirements.

Materials, Design, and Procedure

The passages, design, procedures and scoring were identical to Experiment 3.

Results and Discussion

Recall

ANOVA on the mean number of target points recalled (max = 4) indicated no effect of passage set nor interactions with the condition variable. There was a significant effect of

condition, $F(3, 42) = 6.38$, $p < .01$, $Ms_{error} = .358$ for subjects and $F(3, 42) = 3.52$, $p = .02$, $Ms_{error} = 2.6$ for passages. The condition means are shown in the third panel of Table 3. Orthogonal contrasts indicated that Full signalling (Mn = 3.13) lead to greater recall than the other three conditions, $F(1, 42) = 17.31$, $p < .001$ for subjects and $F(1, 42) = 9.55$, $p < .01$ for passages. The other three conditions did not differ from one another (Mn = 2.41), F s <1 in both analyses. An additional contrast indicated that recall in the Full condition was better than in the Number condition, $F(1, 42) = 7.06$, $p < .05$ for subjects and $F(1, 42) = 3.91$, $.1 > p < .05$ for passages. The same pattern of significant effects was obtained when the elaborated scoring data were analyzed. Thus, as predicted recall was better the more explicit the signalling.

Reading Time

ANOVA on the mean rate per word indicated no effect of set or interaction with condition. There was a significant effect of condition, $F(3, 45) = 3.18$, $p < .05$, $Ms_{error} = 8$ but only when subjects were treated as the random factor. In the Full condition, significantly more time was spent on each word read (Mn = 468 milliseconds) than in the other three conditions (Mn = 397 milliseconds), $F(1, 45) = 7.63$, $p < .01$. The Number, Vague and None conditions did not differ from one another. These means are shown in Figure 2. Similarly, ANOVA on process time per word indicated a significant effect of condition, $F(3, 45) = 3.58$, $p = .02$, $Ms_{error} = 16$ in the subjects analysis but not in the passages analysis. Contrasts on these means indicated that in the Full condition significantly more time was spent on each word (Mn = 662 milliseconds) than in the other three conditions (Mn = 575 milliseconds), $F(1, 45) = 5.63$, $p < .05$. The reading rate and processing time data indicate trends in the predicted direction: the more explicit the signalling, the slower the subjects' rates of reading and the more time they spent on the passage .

Insert Figure 2 about here

General Discussion

The monolingual, native English speakers in Experiments 2 and 4 showed the same pattern of effects for the sequence marker variable: Whether passages were presented in booklet or computer form, the Full signalling condition produced the highest recall of the targeted information. The ESL students also performed consistent with our predictions, recalling the most from passages presented in the Full signalling condition. However, patterns of significant differences among the four conditions appeared to differ somewhat for the native English and ESL students. For the native English speaking students in both experiments, recall was significantly better in the Full condition than in the Number condition but the Number and Vague conditions did not differ. This pattern suggests that for the native English speakers, the critical aspect of the signalling was the presence in the body of the text of the explicit enumerators signalling the target points. Just knowing how many points to look for did not substantially help these students. In contrast, for the ESL students the Full and Number conditions did not differ significantly but the Number condition led to better recall than the Vague condition. The pattern for the ESL students suggests that knowing how many target points to look for and subsequently recall was almost as important as knowing which specific points were the targets.

However, the differences in the results of the comparisons of the means may be more apparent than real: the ordering of the means across the four conditions was the same in all three experiments. In fact, an ANOVA conducted to determine if recall by the native English speakers exceeded that of the ESL speakers indicated no main effect of language group and no interaction with condition, which remained a significant main effect, $F(3, 84) = 13.77$, $p < .01$, $Ms_{error} = .4$. Contrasts on the condition means (collapsed over language group) indicated that Full signalling (Mn = 2.92) led to better recall than the other three conditions (Mn =

2.28), $\underline{F}$ (1, 84) = 30.81, $\underline{p} < .01$; that recall was better in the Number condition (Mn = 2.5) than in the Vague condition (2.06), $\underline{F}$ (1, 84) = 7.58, $\underline{p} < .01$; and that the Full condition led to better recall than the Number condition, $\underline{F}$ (1, 84) = 7.08, $\underline{p} < .01$.

Thus, the recall of all students benefitted from the presence of explicit marking of the target points and from topic sentences that specifically indicated the number of points that were to be discussed. Vague or no signalling consistently led to relatively poor recall behavior. The processing time data are suggestive of why such marking helps recall. There was a general tendency to process the fully marked passages longer than passages containing less explicit structural signals. Caution must be exercised however in interpreting and generalizing these trends. For these passages, the monolingual English students read longer and slower when information was explicitly marked. The ESL students read at the same rate and for approximately the same amount of time regardless of the signalling, although the processing time measure reflected the trend present in the monolingual English students. It should also be noted that the ESL students spent 33% to 50% more time on the passages than did the monolingual English students. [5] Yet, their recall was at equivalent levels.

It thus appears that ESL students are aided by the presence of explicit signals to the organization and important points in a text in a manner that is similar to the effect of these rhetorical devices on native English speakers. One interpretation of the differences between the monolingual and ESL students in the effect of signalling on the process time measure is that the ESL students may make less strategic use of these signals during reading than do the monolingual English speakers. Alternatively, these signals may serve to focus the attention of the ESL students in a way that is different from the way they allocate their reading time when there are no signals. This is an empirical question we are currently pursuing (Goldman, 1988) by investigating what strategies students use for reading and how the presence of signals affects those strategies.

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Footnotes

1. Analyses of covariance using the idea development ratings obtained in Experiment 1 as the covariate indicated an identical pattern of significant effects and contrasts on the means for both target point recall and for elaborated point recall. The adjusted means for target point recall were the following: Full = 2.37; Number = 1.75; Vague = 1.74; and None = 1.59. For elaborated recall the adjusted means were Full = 2.77; Number = 2.21; Vague = 2.17; and None = 1.83. Because the pattern of significance did not differ from that obtained in the ANOVA, in subsequent studies we did not conduct the ANCOVA.

2. The difference between the two measures is in the denominator; the numerators are the same. In the case of the rate measure the denominator changed if a student read the same sentence more than once. The denominator remained constant in the processing time measure.

3. It should be noted that there was a significant effect of set on the process time measure in the passage analysis only, $F(1, 14) = 5.37$, $p = .04$, but there was no interaction with condition. Because it did not interact with condition and was significant only in the passage-as-random effect analysis, the set factor is not considered further.

4. Because of the way in which the rate and the process time measures are computed, process time per word increases only when the student returns to a sentence after having read some other sentence. Thus, longer process times resulted when students went back to reread a sentence they had previously read. The rate measure cannot differentiate between a person who read each word in a sentence once but for a long period of time from a person who read each word quickly but reread the sentence several times before going on to the next sentence. The rate and process time measures would be identical for a student who read each sentence only once. The process time measure is therefore a more reliable way of capturing an overall picture of how much time was spent reading the text.

5. The reading rate and the processing time data failed to meet homogeneity of variance tests and thus were not submitted to a combined ANOVA.

Table 1
Sample Passage[a]

The Ideal State

Plato was concerned with achieving systematic unity of a society. He did not believe that the primary role of the state was to ensure a feeling of well-being in each one of its participants. According to his theory, the state is a permanent organization that, as a whole, has definite needs and a definite inner structure, and goals that are higher than that of making individuals happy. **In his reflections on society, Plato was concerned with four** (several) **basic issues**. **First**, he was convinced that increasing individualization threatened the social order. His model of the ideal state provided for numerous measures that would ensure the citizens' conformity, both in their public behavior and in their thoughts and feelings. He provided for supervision and control of all aspects of individual life. **Second**, Plato's conception of the state addressed the problem of the division of labor and specialization. He argued that no human being was self-sufficient and so the coexistence of human beings must be based on mutual exchanges of services. The individual and the state would each attain wholeness and prosper only if labor was divided so that each man did the task for which nature had designed him. **Third**, Plato attached great importance to the optimal size of a city. He thought that the city could be either too small or too large, and he actually fixed the optimum population of the Greek city at 5,040. He strongly believed that excessive territorial expansion and increased population of the state posed a particular threat to its unity. **Fourth**, he attached great significance to the problem of differentiation of wealth within the society. He saw increasing social inequalities as a major source of decomposition of the state because it led to the interests of small groups being put before the interests of the society. He argued for the abolition of private property and the family, regarding both as prime sources of the problem. Plato viewed society as an interdependent system made up of many parts possessing their own interests. He was interested in social facts insofar as they had definite consequences for the integration or disintegration of society. Above all, he was concerned with discovering conditions that were conducive to social integration and equilibrium.

[a]The text for the "Full" signalling condition used the bold faced information. The number condition used only the bold faced sentence, not the specific sequence terms, e.g., First, Second, etc. The Vague condition also did not use the number terms; the topic sentence used the parenthesized term instead of the specific number term. In the None condition, the topic sentence excluded both the specific and the vague quantifier and did not use the sequence markers at the front of each sentence.

Table 2

Mean ratings on ease of understanding, idea development and vocabulary

	Signalling condition			
	Full	Number	Vague	None
Ease of understanding	2.005	2.086	2.159	2.154
Following idea development	2.018	2.284	2.388	2.336
Ease of vocabulary	1.669	1.65	1.69	1.69

Table 3

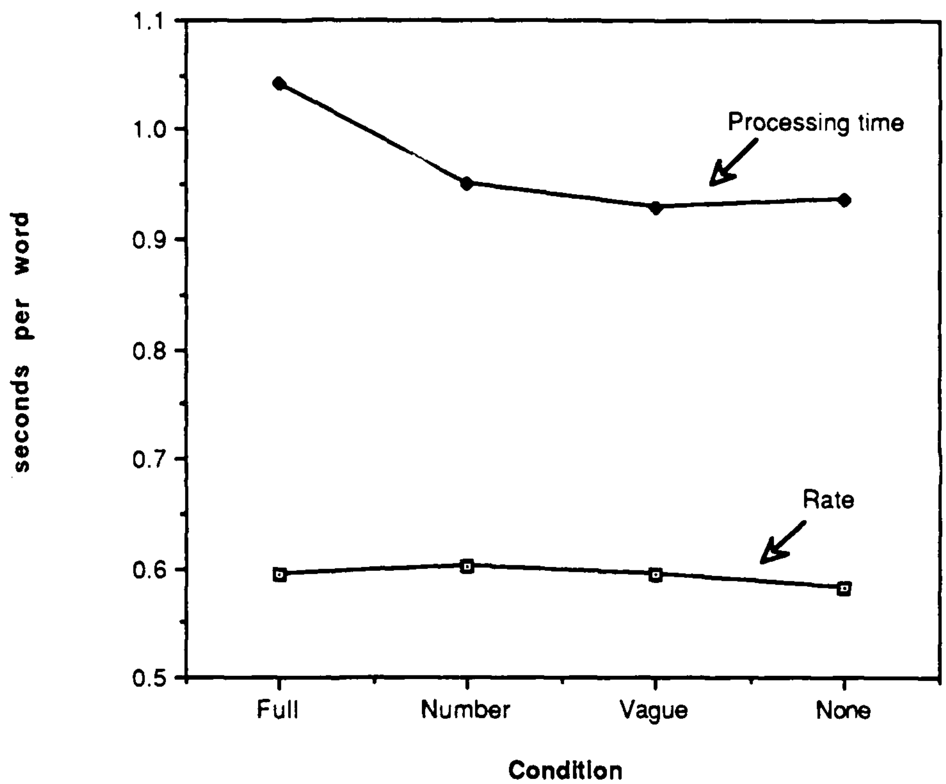
Mean recall of the target points (max = 4) by native English speakers (Experiment 2), English-as-second-language (ESL) speakers (Experiment 3), and native English speakers (Experiment 4)

	Signalling condition			
	Full	Number	Vague	None
<u>Experiment 2</u>				
Native English speakers (n = 32)	2.5	1.73	1.67	1.55
<u>Experiment 3</u>				
ESL speakers (n = 16)	2.72	2.44	1.84	1.72
<u>Experiment 4</u>				
Native English speakers (n = 16)	3.13	2.57	2.29	2.38

Figure Captions

Figure 1. Mean reading rate per word and mean processing time in four signalling conditions for ESL speakers (Experiment 3).

Figure 2. Mean reading rate per word and mean processing time in four signalling conditions for native English speaking students (Experiment 4).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1.0
0.9
0.8
0.7
0.6
0.5
seconds per word
Processing time
Rate
Full
Number
Vague
None
Condition

Figure 1

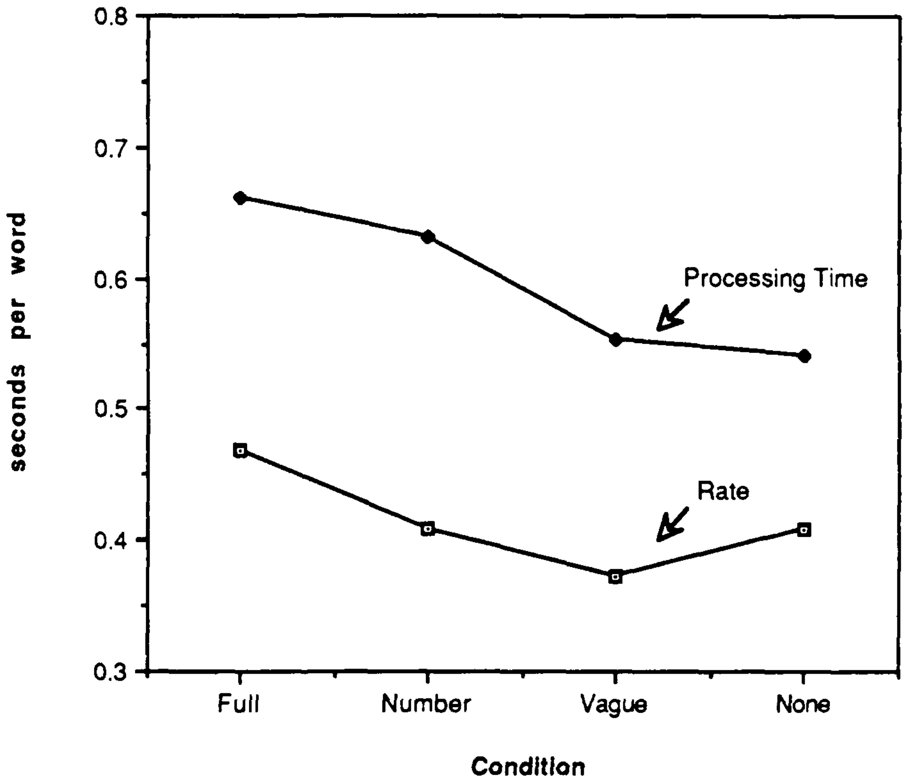
0.8
0.7
0.6
0.5
0.4
0.3
seconds per word
Processing Time
Rate
Full
Number
Vague
None
Condition

Figure 2

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